

**Amendments to the Drawings**

Attached are replacement drawing sheets for amended Figures 2, 4 and 16.

**REMARKS**

The abstract and specification have been amended in order to correct grammatical and idiomatic errors contained therein. No new matter has been added.

The disclosure is objected to because it appears to be a direct translation from a foreign language and is replete with errors and awkward language, and because of informalities. The specification has been amended to cure the informalities with proper languages and paragraph numerals. Therefore, withdrawal of the objection to the disclosure is respectfully requested. No new matter has been added.

The drawings are objected to because reference numeral "5" is used to designate both "coil spring" in Figure 1 and "disc spring" in Figure 4, and because Figure 16 should be designated by a legend "Prior Art." Figure 4 is amended so that "disc spring" is designated by reference numeral "5-1." Figure 16 is also amended to include a legend "Prior Art." Further, Figure 2 is amended so that the second lubricating ring is designated by reference numeral "2-1," and the fourth lubricating ring is designated by reference numeral "13-1." Therefore, withdrawal of the objection to the drawing is respectfully requested. No new matter has been added.

In order to expedite the prosecution of the present application and respond to the formal rejections made by the Examiner, Claims 1-12 have been amended to more particularly point out and distinctly claim the subject matter which Applicant regards as the invention, or to cure grammatical and idiomatic errors contained therein. Particularly, Claims 1-5 incorporate additional limitations to clearly distinguish from the prior arts. The limitations added in Claims 1 and 2, "the hinge housing having a first through-hole through which the rotation shaft pierces on one side of the rotation torque unit and a second through-hole through which a harness wiring can pass on the other side of the rotation torque unit," are supported by paragraph [0030]. The limitation added in Claim

3, "a plurality of the rotation torque generating portions have torque generating operations to generate the sliding torque and the click torque by abutting the first fixing cam and the first rotating cam, the torque generating operations being different and independent to one another by combining the first fixing cam and the first rotation cam having different positions," is supported by paragraph [0008]. The limitation added in Claim 4, "a plurality of the rotation torque generating portions have torque generating operations to generate the sliding torque and the click torque by abutting the second fixing cam and the second rotating cam, the torque generating operations being different and independent to one another by combining the second fixing cam and the second rotation cam having different positions," is supported by paragraph [0009]. The limitation added in Claim 5, "a cross-section of a part of the rotation shaft and the opening/closing shaft is other than a circle," is supported by paragraph [0010]. It is respectfully submitted that the currently presented claims contain no new matter and are cured of all formal defects. No new matter has been added.

The rejection of Claims 1-12 under 35 USC §112, second paragraph, has been considered. In order to advance prosecution, Claims 1-12 have been amended to particularly point out and distinctly claim the subject matter which Applicant regards as the invention, or to conform with current U.S. practice. Claims 3 and 4 have been amended to so that the expression, "a pair and/or" is deleted. Claim 8 has been amended to so that "a penetrably holed shaft" is replaced with "the rotation shaft having the penetrating hole." Claim 10 has been amended to so that "another member" is not included in Claim 10. Further, Claims 1-12 have been amended to cure informalities and to conform with current U.S. practice. Therefore, withdrawal of the rejection under 35 USC §112, second paragraph, is respectfully requested.

Claims 1-6 and 8-12 stand rejected under 35 U.S.C. §103(a), as being obvious over, Mizuta et al., JP Patent No.

JP 2003-304316A in view of Tseng et al., US Patent No. 6 587 333 B2. Applicant respectfully traverses this ground of rejection and urges that the presently claimed invention is patentably distinguishable over the prior arts cited by the Examiner.

The instant invention as defined in Claim 1 is directed to a two-shaft hinge having a two-shaft structure, comprising:

- a rotation shaft;
- an opening/closing shaft;
- a rotation torque unit in which a plurality of rotation torque generating portions are provided on the rotation shaft, the rotation torque generating portions being assembled by putting a first coil spring around an outer periphery of the rotation shaft having a penetrating hole and by abutting a first fixing cam and a first rotating cam on both ends of the first coil spring; and
- an opening/closing torque unit in which a plurality of opening/closing torque generating portions are provided on the opening/closing shaft, the opening/closing torque generating portions being assembled by putting a second coil spring around the opening/closing shaft and by abutting a second fixing cam and a second rotating cam on both ends of the second coil spring,

wherein an axial direction of the rotation shaft and an axial direction of the opening/closing shaft are assembled to a hinge housing to be perpendicular to each other, the hinge housing having a first through-hole through which the rotation shaft pierces on one side of the rotation torque unit and a second through-hole through which a harness wiring can pass on the other side of the rotation torque unit, the torque units generate a sliding torque and a click torque at rotation, and an opening/closing operation function on the rotation shaft and the opening/closing shaft, and the opening/closing torque

unit is assembled to either a right side or a left side of the rotation torque unit.

Mizuta teaches a two-shaft hinge mechanism used for a foldable and portable mobile communication terminal. Specifically, Mizuta discloses the two-shaft hinge mechanism, comprising: a first hinge unit 320 that allows an upper-side body unit to rotate with respect to a lower-side body unit up to an open state defining a predetermined talking position; and a second hinge unit 310 that allows the first hinge unit 320 to rotate in a direction different from the rotational direction of the first hinge unit, wherein the first and the second hinge units are coupled so that the rotational center axes orthogonally intersect each other. Also, Mizuta teaches a fixed shaft 312 located in an outer case 311 and fixed by a base bracket 301, the first rotating shaft (opening/closing rotating shaft) 321. The first hinge unit 310 includes a fixed cam 323, a rotating cam 324, and a coil spring 325. The second hinge unit 310 also includes rotating cams 314a and 314b, fixed cams 313a and 313b, and a coil spring 315. Further, Mizuta discloses that portions serve as a torque unit generating a rotational torque, and that other portions serve as a torque unit for generating an opening/closing torque.

Mizuta, however, does not disclose that the structure of the rotation shaft has a penetrating hole of the present invention, which allows a harness wiring.

In addition, Mizuta does not teach that the opening/closing torque unit of the present invention is assembled to either a right side or a left side of the rotation torque unit. Also, Mizuta does not show that the hole through which the harness wiring can pass is provided on the other side of the rotation torque unit.

The Examiner states that Mizuta does not disclose the fixing cam and the rotating cam on both ends of the coil spring for the opening/closing shaft, but that Mizuta does teach the use of the fixing cam and the rotating cam on both ends of the coil spring for the rotating shaft. Further, the

Examiner admits that Mizuta does not teach the rotation shaft having the penetrating hole, and cites Tseng so as to allegedly cure this deficiency.

Tseng teaches a tilt/swivel hinge mechanism for large devices such as computers and electronic books. Tseng discloses that the mounting base 33 has a second cylinder 333 having a cable hole 332 formed at the center of the second cylinder 333 to hold the swivel base 32. However, there is no motivation whatsoever to combine the mounting base 33 of Tseng with the two-shaft hinge of Mizuta, because the two-shaft hinge of Mizuta also contains the fixed shaft 312 fixed to the base bracket 301, and the outer case 311 of Mizuta can rotate about the fixed shaft 312 as a central axis.

Further, as shown in Figure 5 of the Mizuta reference, the fixed shaft 312 of Mizuta does not have the penetrating hole and does not perpendicularly penetrate through the center axis of the opening/closing shaft, while the present invention includes the rotation torque unit and the opening/closing torque unit that are assembled to the hinge housing so that the axial direction of the rotation shaft and the axial direction of the opening/closing shaft are perpendicular to each other. The rotation torque unit and the opening/closing torque unit of Mizuta are not assembled to the hinge housing, and thus the rotation shaft cannot penetrate through the center axis of the opening/closing shaft. Even if the rotation shaft of Mizuta has the penetrating hole, the penetrating hole of the rotation shaft does not go through the center axis of the opening/closing shaft, which makes wiring through the penetrating hole in the rotation shaft impossible.

On the contrary, the two-shaft hinge of the present invention has a hinge housing to which the rotation torque unit and the opening/closing torque unit are assembled, which enables the wiring penetrating through the rotation shaft from top to bottom. Thus, the combining the mounting base 33 of Tseng, which includes the second cylinder 333 having the cable hole 332 formed at the center of the second cylinder 333, with

the two-shaft hinge of Mizuta cannot show the two-shaft hinge of the present invention.

The tilt/swivel hinge mechanism of Tseng is used for large devices, whereas the two-shaft hinge of the present invention is used for a folding/rotating mechanism part on small electronic devices. The present invention provides two-shaft hinge components which enable the harness wiring by using a hollow rotation shaft, and thus improves durability and reduction in size and weight of the devices. On the other hand, the tilt/swivel hinge mechanism of Tseng uses torsion by the friction between the projection of the elastic member and the surface of the swivel base, and thus the size of Tseng's hinge and torque required to activate rotation or opening/closing action is different from the size of the present invention. Therefore, the technical field of Tseng's invention is totally different from that of the present invention. There would be no suggestion or motivation to combine the hinge mechanism of Tseng with Mizuta's two-shaft hinge, and it is not guaranteed that the Tseng's mounting base 33 with the cylinder 333 having a cable hole 332 would work properly with the Mizuta's hinge. Moreover, attempting to incorporate Tseng's mounting base into Mizuta's hinge would necessarily involve a complete re-structuring of Mizuta's disclosed arrangement.

Accordingly, Claim 1 is believed to be patentably distinguishable over Mizuta and Tseng, alone or in combination with one another.

Claim 2 is directed to the same two-shaft as Claim 1, except that a pair of rotation torque generating portions, rather than a plurality of rotation torque generating portion, are provided on the rotation shaft, and therefore, is believed to be allowable over Mizuta and Tseng for the same reasons as presented above relative to Claims 1.

Claims 3-6 and 8-12 depend upon what is believed to be an allowable Claim 1, are believed allowable therewith, and include additional features which further distinguish over

Mizuta and Tseng. For example, Claim 3 further discloses that the rotation torque unit is assembled on the rotation shaft, and that a plurality of the rotation torque generating portions are assembled on the rotation torque unit and have torque generating operations to generate the sliding torque and the click torque by abutting the first fixing cam and the first rotating cam, the torque generating operations being different and independent to one another by combining the first fixing cam and the first rotation cam having different positions of a concave groove and a convex protrusion of the first fixing cam and the first rotation cam or by combining different numbers of the cams. Similarly, Claim 4 discloses that the opening/closing torque unit is assembled on the opening/closing shaft, and a plurality of the opening/closing torque generating portions are assembled on the opening/closing torque unit and have torque generating operations to generate the sliding torque and the click torque by abutting the second fixing cam and the second rotating cam, the torque generating operations being different and independent to one another by combining the second fixing cam and the second rotation cam having different positions of a concave groove and a convex protrusion of the second fixing cam and the second rotation cam or by combining different numbers of the cams. Mizuta and Tseng do not teach such torque generating operations, and the assembly of the torque units or a plurality of the torque generating portions.

Claim 5 discloses that a cross section of a part of the rotation shaft and the opening/closing shaft is other than a circle, or is formed to be a quadrangle or a shape having a major axis and a minor axis, allowing the first and the second fixing cams for rotation and opening/closing, which are used respectively in the rotation torque generating portions and the opening/closing torque generating portions, to move respectively in the axial direction of the rotation shaft and the axial direction of the opening/closing shaft, but inhibiting the first and the second fixing cams from rotating



with respect to the rotation shaft. Mizuta discloses that the fixed shaft 312 has substantially a solid-cylindrical shape or hollow-cylindrical shape, and is fixed to the base bracket 301, but Mizuta does not disclose a cross section of a part of the rotation shaft and the opening/closing shaft is other than a circle, or is formed to be a quadrangle or a shape having a major axis and a minor axis.

Claim 6 discloses a stopper mechanism to restrict a rotation angle and an opening/closing angle of the rotation shaft and the opening/closing shaft so that rotation ranges of the rotation shaft and the opening/closing shaft are restricted. Mizuta discloses a movable rotation stopper 317 and a rotation stopper in order to limit the rotational angle of the upper-side body unit 20, rather than restrict the angles of the rotation shaft and the opening/closing shaft.

Claim 8 discloses that the rotation shaft having the penetrating hole in which a through-hole is provided at a center of the rotation shaft, in order to enable the harness wiring. As discussed above for Claim 1, Mizuta and Tseng do not disclose even the rotation shaft having the penetrating hole.

Claim 9 discloses that a case for the rotation shaft and a case for the opening/closing shaft in each of which an outer periphery has a groove or a deformed cross-section other than a circle are fitted with or fixed to the first and the second rotating cams in each of which an outer periphery has a protrusion or a deformed cross-section. Although Mizuta teaches outer cases 311, 322, Mizuta does not disclose that the outer periphery of the cases have the groove or the deformed cross-section other than a circle.

Claim 10 discloses that the first rotating cam used in the rotation torque generating portions is configured to be a bottom portion to which the rotation torque unit is fitted and attached in the hinge housing. Both Mizuta and Tseng do not teach such a feature.

Claim 11 discloses that the rotation torque unit and the opening/closing torque unit are assembled as an independent unit, the torque units being fitted and attached to or screwed into the hinge housing in which a means for fitting or screwing to fix is provided in advance. Both Mizuta and Tseng do not disclose such a feature.

Claim 12 discloses a fixing base component adhered to the rotation shaft for mounting and fixing the two-shaft hinge to a device chassis, wherein the two-shaft hinge is fixed by the base component. Mizuta shows the fixed shaft 312 fixed by the base bracket 301, but does not show the fixing component.

Claim 7 stand rejected under 35 U.S.C. §103(a), as being obvious over, Mizuta et al., JP Patent No. JP 2003-304316A in view of Tseng et al., US Patent No. 6 587 333 B2 and in further view of Katoh, US Patent No. 5 867 872. Applicant respectfully traverses this ground of rejection and urges that the presently claimed invention is patentably distinguishable over the prior arts cited by the Examiner. Claim 7 teaches a disc spring, a waved plate spring, or a thin plate spring in place of the first and the second coil springs which generate an abutting force in the torque generating portions. Katoh teaches disk springs 17 in mutually facing positions so as to press the rotating cam member 16 against the stationary cam member 12 side, but Katoh does not disclose the waved plate spring and the thin plate spring.

Accordingly, Claim 7 is believed to be patentably distinguishable over Mizuta, Tseng, and Katoh, alone or in combination with one another.

For the above reasons allowance of Claims is respectfully requested. Further and favorable reconsideration is respectfully requested.

Respectfully submitted,

  
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Replacement Abstract  
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